

REPORTS on the MARINE BIOLOGY of the SUDANESE RED SEA.—VI. On the CEPHALOPODA. By WILLIAM E. HOYLE, M.A., D.Sc. (Communicated by Prof. W. A. HERDMAN, F.R.S., P.L.S.)

[Read 20th June, 1907.]

THE present collection is too small to be the basis of any generalisations regarding the Cephalopod fauna of the Red Sea; so far as it goes, however, it points to a resemblance between the various divisions of the Indian Ocean. Of the nine species which it contains four (possibly five) also occur in the waters around Ceylon and three at Zanzibar. A few specimens collected by Mr. Crossland at the Cape Verde Islands are also included.

The most interesting point, however, is the occurrence in the collection of a complete specimen of *Sepia lefebvrei*, which has hitherto only been known from a single shell, described and figured seventy years ago by d'Orbigny.

List of Species.

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| 1. <i>Polypus vulgaris</i> . | 6. <i>Polypus horsti</i> . |
| 2. <i>Polypus</i> sp. | 7. <i>Sepia lefebvrei</i> . |
| 3. <i>Polypus granulatus</i> . | 8. <i>Sepia rouvi</i> . |
| 4. <i>Polypus macropus</i> . | 9. <i>Sepia singalensis</i> . |
| 5. <i>Polypus horridus</i> . | |

POLYPUS VULGARIS (*Lamarck*).

Octopus vulgaris, Lamarck, 1799, p. 18; Ferussac & d'Orbigny, 1835, p. 26, pls. 2, 3 bis, pl. 8, figs. 1, 2, pls. 11–15, pl. 29, fig. 6; Jatta, 1896, p. 212, pl. 4, fig. 1, pl. 7, fig. 9, pl. 8, fig. 6, pl. 22, figs. 2–10, pl. 23, figs. 1–4.

Localities.—Shore near Sal Rei, Boa Vista, Cape Verde Is.; two specimens, ♂ [1436, 1437].

Various localities, St. Vincent, Cape Verde Is.; five specimens, 1 ♂ [1439], 4 ♀ [1440–1443].

Previous records.—Cosmopolitan.

The position of the enlarged suckers on the lateral arms of the males shows some variations, which are worthy of note in regard to the value of this character for diagnostic purposes.

<i>Specimen.</i>	<i>Arm.</i>	<i>Position.</i>	<i>Remarks.</i>
1436	2 R.	8th, 9th.	The enlargement is not very marked; the 9th is followed by a small sucker in the middle line, after which is the usual double series.
	3 R.	11th, 12th.	Enlargement considerable, followed by a sudden diminution, as though the arm had been amputated and grown again.
	2 L.	11th, 12th.	Followed by a gradual diminution.
	3 L.	12th.	Somewhat enlarged, the 11th and several others have apparently been bitten out and are being reproduced.

Specimen.	Arm.	Position.	Remarks.
1437	2 R. }	9th, 10th.	Followed by a rather sudden diminution.
	3 R. }		
	2 L.	8th, 9th.	Followed by a very gradual decrease.
1439	3 L.	10th, 11th.	Do. do.
	2 R.	8th to 10th.	Gradual increase, then a small single median sucker, followed by the usual double series.
	3 R.	7th, 8th.	Followed by a sudden diminution.
	2 L.	8th to 10th.	Followed by a gradual diminution.
	3 L.	8th, 9th.	Do. do.

The arms are numbered from the dorsal to the ventral aspect on the right and left sides respectively. It will be seen that the position of the enlarged suckers is not constant in the same specimen, nor even in the two arms of the same pair.

POLYPUS sp. ?

Locality.—St. Vincent, Cape Verde Is.; six young specimens, ♀ [1444–1449].

These six young Octopuses came in the same bottle with five that I have named *Polypus vulgaris* [1439–1443], and I am not quite sure that they may not be a variety of the same species, but they differ in being much paler and of a reddish rather than a purplish-brown colour above. The dorsal surface of the back, head, neck, and roots of the upper arms is covered with small hemispherical papillæ, not rough, irregular warts. They have two papillæ over each eye, and one example has four arranged in a rhomb on the back. In some respects they resemble *Polypus granulatus*, but the colour is different and the rough surface does not extend over the inner aspect of the umbrella.

On the whole I am inclined to think they are not *P. vulgaris*, but I have failed to identify them with any known form and think it would not be advisable at present to propose a new species for their reception.

POLYPUS GRANULATUS (*Lamarck*).

Octopus granulatus, Lamarck, 1799, p. 20.

Polypus granulatus, Hoyle, 1904, p. 195.

Locality.—Suakim Harbour; one specimen, ♂ [1096].

Previous records.—Cosmopolitan.

POLYPUS MACROPUS ? (*Risso*).

Octopus macropus, Risso, 1826, p. 3; Vérany, 1851, p. 27, pl. 10; Hoyle, 1886, pp. 11 & 95; Lönnberg, 1897, p. 706; Joubin, 1898, p. 22.

Octopus cuvieri, Férussac & d'Orbigny, 1835, p. 18, pls. 1, 4, 24, & 27; Appellöf, 1886, p. 6, pl. 1. fig. 6.

Polypus macropus, Hoyle, 1904, p. 195.

Localities.—Suez Harbour, purchased from fisherman; one specimen, ♀ [1903]; one young specimen, ♀ [1080].

St. Vincent, Cape Verde Is., purchased by the Rev. C. S. Eveleigh; one specimen, ♀ [1438].

Previous records.—Mediterranean; Red Sea; Indo-Malayan Region; Japan; Australia; Teneriffe.

The largest specimen (1093) has a large ovate pinkish body, smooth except for a slight wrinkling, without any warts or cirri. It has the enlarged suckers on the dorsal arms, but the arms are distinctly shorter in proportion to the body than indicated by d'Orbigny's description and figures. The actual measurements are:—

Length of mantle		11 cm.
Length of first arm	Right 53 cm. Left 51 cm.	
Length of second arm	„ 53	„ 50
Length of third arm	„ 38	„ 41
Length of fourth arm	„ 34	„ 35

The smallest specimen (1080) agrees in all essentials with the larger, and is certainly the young of the same species.

Specimen 1438 appears to be referable to this species, but it is in a very unsatisfactory state of preservation and the label states that it was partly decayed when obtained.

POLYPUS HORRIDUS (*d'Orbigny*).

Octopus horridus, d'Orbigny, 1826, p. 54; Férussac & d'Orbigny, 1835, p. 51, pl. 7. fig. 3.

Polypus horridus, Hoyle, 1904, p. 194, pl. 2. figs. 10, 13 [entered by error as *P. aculeatus*]; Id. 1905, p. 978; Id. 1907, p. 454.

Localities.—Suez, low tide, December 1904; one specimen, ♂ [1078]; mud flats, January 1905, collected by J. Logan, two young specimens, ♀ [1084, 1085], one ♂ [1083].

Khor Dongola, among coral from reef, three young specimens, ♀ [1086–1088], one sex? [1089]; taken from the crevice of a coral in breaking it up, one young specimen, ♀ [1079].

Suakim Harbour, one specimen, ♀ [1090].

Previous records.—Red Sea, Egyptian shore (*d'Orbigny*); Cape of Good Hope (*Krauss*); Ceylon (*Hoyle*); Male Atoll (*Hoyle*); Zanzibar (*Hoyle*).

Specimen 1078 shows enlarged suckers near the base of the fourth arm on the right side, and of the third and fourth arms on the left; this example is recorded as having been “greenish, with a papillate skin” when fresh.

Specimen 1079 is flaccid and looks as though it had been preserved in formol after death; the pale patches are indistinct; the body is an elongated ovoid, contrasting with the short stumpy form of most other examples.

Specimens 1087 and 1088 are very dark in colour, the paler areolæ being scarcely distinguishable.

Specimen 1089 has the tissues swollen and subgelatinous, as though distended with fluid. It is very dark in colour, almost melanotic, and hence

the characteristic markings are very indistinct; the papillæ in the centres of the lighter areas are small and can only be made out by the aid of a lens. The second and third arms on the left side and the third on the right have been lost and their replacement has commenced. The rudiments of the new arms grow out just below the skin on the outer aspect, as mentioned in the case of *P. horsti*, Hoyle, 1907, p. 452.

Three specimens (1083-1085), found together, must I think be melanic examples of this species. In strong sunlight I can see indications of the circular lighter-coloured areas, especially in the larger example, which measures 25 mm. from the posterior end of the mantle to the centre of the eyes. In the smallest, the corresponding measurement of which is 18 mm., they are barely distinguishable; but the three resemble each other so closely that they undoubtedly belong to one species. These specimens were collected half a mile beyond the Bacht Hotel, where a tidal stream flows from the flats into the canal.

POLYPUS HORSTI (*Joubin*).

Octopus horsti, Joubin, 1898, p. 23.

Polypus horsti, Hoyle, 1907, p. 451.

Localities.—Suakim Harbour, one young specimen, ♀ [1091], one specimen, ♀ [1337]; purchased from a fisherman; one specimen, ♀ [1081].

Previous records.—Jeddah, Red Sea (*Joubin*); Zanzibar (*Hoyle*).

In specimen 1337 the ocellar spots are very indistinct, especially that on the right side, showing that this character might be easily overlooked in certain conditions of the chromatophores. The length of the mantle is 7 mm.; the tip of the hectocotylied arm measures 4 mm. in length, and there are about a dozen delicate transverse ridges in the hollow.

No. 1081 is a very puzzling specimen, and I was at first disposed to identify it as *P. horridus*. The zebra-like markings on the arms are hardly perceptible, but the ocellar spot is very well marked indeed. The surface is very rugose; above and behind each eye is a large wart with three or four wartlets upon it, and a small wart behind it. Above and before each eye is a small wart, whilst another still further forwards in the middle line forms a triangle with these two. There are four warts in the form of a small lozenge on the back and several others scattered irregularly about. The papilla at the posterior end of the mantle is pushed out of the centre and is made out only with difficulty owing to the stretching of the skin in that region. On the whole I regard it as an aberrant example of *P. horsti*.

No. 1091 has a smooth surface and the ocellar spot, but the characteristic transverse barring of the arms is for the most part indistinct; there are, however, traces of it here and there, and as the specimen is young these might very probably become better marked with further development of the individual.

SEPIA LEFEBREI, d'Orbigny.

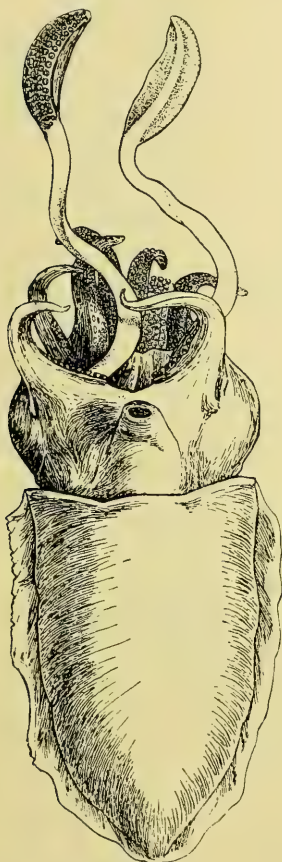
Sepia lefebrei, d'Orbigny, in Férussac & d'Orbigny, 1835, p. 282, pl. 24. figs. 1-6, 1839; d'Orbigny, 1845, p. 288, pl. 13. figs. 5, 6.

Locality.—Suez mud-flats, 2 to 3 fathoms; one specimen, ♂ [H. 1097].

Previous record.—Koseir, Red Sea.

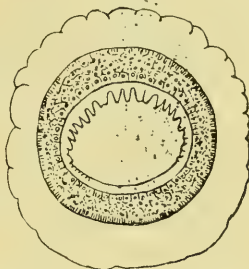
The Body is hemielliptical in outline, narrow, broadest anteriorly, bluntly pointed behind. The *fins* are narrow, only about one-eighth the breadth of

Fig. 1.

*Sepia lefebrei*.

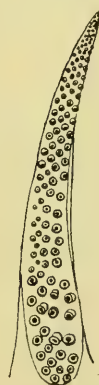
Ventral view of the specimen,
enlarged about $\frac{4}{3}$.

Fig. 2.



A sucker from one of the sessile arms:
 $\times 50$.

Fig. 3.



The left ventral hectocotyliised arm.
 $\times 3$.

the body; they extend to the mantle-margin in front and to within about 1 mm. of each other posteriorly. The *mantle-margin* is slightly pointed over the head dorsally, and only very little emarginate below. The *mantle connective* is of the form usual in the genus. The *siphon* is convexly conical and extends just up to the space between the arms.

The Head presents no distinctive characters.

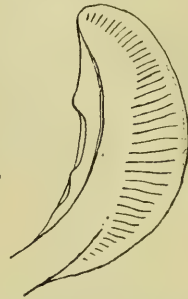
The Arms are subequal, the order of length being 4, 3, 2, 1 on the right side and 4, 2, 3, 1 on the left; they taper evenly towards the extremities; those of the fourth pair are sharply keeled externally. *The suckers* are in four rows, except on the dorsal pair, where they appear to be in two rows owing to the lateral compression of the arms; they are of moderate size and

Fig. 4.



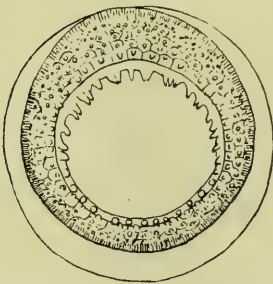
Front view of the tentacular club :
× 3.

Fig. 5.



Back view of the tentacular club :
× 3.

Fig. 6.



One of the large tentacular suckers :
× 50.

Fig. 7.



Portion of the horny ring and papillary
area, from the same sucker as fig. 6 :
× 172.

marked with irregular meridional grooves. *The horny ring* (fig. 2) has about fifteen teeth in the distal semi-circumference, most of these are slender and bluntly pointed, but some are broad, and notched at the extremity as though made up of two or three teeth fused together; there is a papillary area of the usual kind round the horny ring. What I take to be a form of *hectocotylisation* is seen on the fourth left arm (fig. 3); about one-fourth up the arm the two dorsal rows of suckers become much smaller and continue so till rather more than halfway up; no arrangement of grooves and ridges was seen. Perhaps the *hectocotylisation* was only partially developed; the

genital gland was in a very rudimentary condition, but I believe the specimen to be a male.

The *Umbrella* is but little developed, especially between the ventral arms. The *buccal membrane* has the usual seven points, five of which bear one sucker each. The *outer lip* is thin with close-set radial grooves; the *inner* thick and papillate.

The *Tentacles* are about as long as the head and body together; the *stem* is rounded, with three not very prominent angles. The *club* (figs. 4 & 5) is broad, flattened and crescent-shaped; on the dorsal margin is a rather broad marginal web; on the outer surface a series of shallow parallel grooves. The *suckers* are in eight rows, the central ones being the largest and of about the same size as those on the arms; they gradually diminish towards the ends and the sides, the marginal ones being about half the diameter of those in the middle. The *horny rings* of the largest suckers (fig. 6) are somewhat larger than those of the arms; there are sixteen bluntly pointed teeth on the distal semicircumference, many are split as if undergoing bifurcation; the proximal half-ring has about sixteen small, blunt, rounded teeth. The *papillary area* is shown in fig. 7.

The *Surface* is smooth.

The *Colour* dull purplish grey, paler and more yellow below.

The *Shell* in the present example had undergone some maceration and broke in the process of extraction, but it has been admirably depicted by Férussac and d'Orbigny, and the following description is based partly on their figures. It is elongate oval in *outline*, the greatest breadth being nearly in the middle; the free *chitinous margin* is everywhere narrow, broadest in the anterior half, it is continuous and expanded around the hinder end, much as in the genus *Sepiella*, and there is no trace of a *spine*. The *inner cone* is shallow, its limbs slender and extending only about one-fourth the length of the shell. The *dorsal surface* is covered with minute rounded granules. The *ventral surface* is elevated into a large, prominent, rounded keel, which rises gradually from the posterior hollow of the shell, reaches its maximum height a little in front of the middle and sinks more rapidly towards the anterior end; the *last loculus* has an index of 37. It was not possible to make out its hinder boundary exactly, as the shell had become somewhat macerated and was injured in removal.

Dimensions.

End of body to mantle margin	40 mm.
End of body to eye	43
Breadth of body	24
Breadth of head	22
Breadth of fin	3 to 4
Diameter of largest sucker on sessile arm.....	0·7
Diameter of largest sucker on tentacle	0·7

	Right.	Left.
Length of first arm	15 mm.	15 mm.
Length of second arm	16	16
Length of third arm	17	15
Length of fourth arm	19	18
Length of tentacle	55	—

This species has hitherto been known only from the shell, and hence it has been necessary to give a full description of the soft parts.

SEPIA ROUXI, d'Orbigny.

Sepia Rouxi, d'Orbigny, in Férussac & d'Orbigny, 1835, p. 271, pl. 19, 1839.

Sepia rouxi, Hoyle, 1905, p. 981.

Locality.—Suez, November 1904, purchased from a fisherman; four specimens, ♂ [1074–1077].

Previous records.—Red Sea, Bombay (*d'Orbigny*).

I believe these to be specimens of *Sepia rouxi*, but if this be so the example in Professor Herdman's collection from Ceylon (Hoyle, 1904, p. 198) has been wrongly determined. The only point in which these examples do not agree with d'Orbigny's figures and description is in the extremely narrow fin. I think that this may be due to contraction, as the specimens had evidently been dead some time and are not well preserved. The teeth in the horny rings of the suckers are not so regular as in d'Orbigny's drawings, but these are frequently rather diagrammatic.

SEPIA SINGALENSIS, Goodrich.

Sepia singalensis, Goodrich, 1896, p. 3, pl. 1. figs. 4–8; Hoyle, 1905, p. 198; Hoyle, 1907, p. 459.

Localities.—Suez, mud-flats, purchased from a fisherman; two specimens [1094, 1095].

Suakim, one specimen [1338].

Previous records.—Ceylon (*Goodrich, Hoyle*); Zanzibar (*Hoyle*).

Egg capsules.

A number of capsules containing well-developed *Sepia* embryos were collected at Mersa Makdah in Shubuk [1082], and other capsules undetermined were found under stones in the mud-flats, Suez Bay [1092].

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